

information peculiarly suited to their purpose which he alone of all men living possessed, and which he was particularly anxious to communicate to others.

About this time too, Sir E. Sabine resigned his office of magnetical superintendent, and it might naturally have been supposed that Mr. Broun was the very man to succeed him. The office was, however, discontinued. He now made application to the Government Fund of the Royal Society for a sum of money to enable him to improve and complete the reduction of the Colonial magnetic observations. But the immediate and apparent responsibility from quarter to quarter of the possessor of such grants, was peculiarly fatal to a man like Broun. The work seemed to go on growing the more he examined it, and he was never satisfied without going still more deeply into the subject than he had already gone.

Then his health began to give way, and the thought that he had received money for which he had rendered no equivalent hastened still more the progress of his malady.

At last the end came, and we can now hope no longer to complete his labours as he would have himself completed them had he been spared to us but a little longer.

It has been said of an eminent experimentalist that great as were his successes, his failures must have cost him even more thought. If this be true in experimental research, it is peculiarly true in observational inquiry where every idea in order to be tested entails a laborious investigation. Mr. Broun, whose mind was very fertile, must have often spent great labour apparently to no purpose, but on the other hand his successes were very marked, and he did not hesitate to consider a new fact as abundant compensation for a large amount of failure. We cannot attempt to give here an exhaustive catalogue of his various labours. But we may allude to the volumes embracing the results of the Makerstoun observations as pre-eminent for the skill employed in the development of new methods. These volumes alone must have cost him an immense amount of thought.

In 1861 he communicated to the Royal Society of Edinburgh, two papers of marked value. In one of these the errors and corrections of the bifilar magnetometer were discussed, including the determination of its temperature coefficient, which Mr. Broun showed might be found in a more correct method than that hitherto adopted.

The second of these papers was on the horizontal force of the earth's magnetism, for which he established the annual laws from a discussion of observations taken at various places. He likewise discovered that the variations of this element from day to day are nearly the same over all the world.

For these discoveries he was awarded the Keith Medal of the Royal Society of Edinburgh. We have already alluded to the great labour he spent upon the first volume of the "Results of the Trevandrum Observations." In this volume conclusions of the greatest scientific interest are deduced, and Mr. Broun has been able to give in a complete form the laws which regulate the solar-diurnal variation of magnetic declination near the equator. But his researches regarding the lunar-diurnal variation of this element form perhaps the most original and interesting part of the volume. He has claims to be considered as an independent discoverer of this variation, and he has certainly increased our knowledge of its laws more than any other magnetician. We may mention his observation that the lunar action was reversed at sunrise and that it was much greater during the day than during the night, whether the moon was above or below the horizon, as particularly noteworthy and likely to throw much light on the theory of the subject. We have already alluded to Mr. Broun's discovery of the similarity, all the world over, of the changes from day to day of the earth's horizontal force. Certain of these changes he found to be due to the moon, while others had a period of

twenty-six days. These last he attributed to solar action, and in discussing the subject he found that the greater magnetic disturbances were apparently due to actions proceeding from particular meridians of the sun. This is a subject of very great importance, and its exact meaning has yet to be discovered.

Mr. Broun was no less eminent as a meteorologist than as a magnetician. His observations regarding the barometer are of the greatest importance. In this branch of inquiry he has shown the apparent simultaneity of the changes of mean barometric pressure over a great part of the globe, and he has likewise discovered a period of twenty-six days. He was the first to commence those systematic observations of clouds at various altitudes that are now so extensively made, and in a paper read not long since before the Royal Society of London, of which body he was an old member, he pointed out certain relations between atmospheric motions and the directions of the lines of equal barometric pressure. For his various researches, he obtained in 1878, just one year before his death, the Royal Medal of that Society.

These are only a few of the many labours of one whose loss, so deeply felt by all his friends, may be regarded as a calamity by the cultivators of meteorology and magnetism, branches of knowledge in which he was second to none who has yet appeared.

BALFOUR STEWART

NOTES

DR. WARREN DE LA RUE, F.R.S., has just sent to the Chemical Society Research Fund a third donation of 100*l.*, the whole amount to be devoted to a single research.

In the person of Lady Sabine, who died at Ashley Place on the 28th ult., at the age of seventy-two years, a woman of most remarkable clearness of intellect and of power of memory has passed away. In 1827 she married Sir Edward (then Captain) Sabine, and for more than fifty years her main occupation and her chief enjoyment was to assist him in his investigations, especially in terrestrial magnetism. None but her most intimate friends can know how much of the laborious calculations in the "Contributions" were really effected by her, while she translated Humboldt's "Cosmos" and "Ansichten der Natur," besides numerous smaller papers. One of their oldest friends has truly said, "I deeply sympathise with Sir Edward; the death of his wife has rendered the number of beautiful lives in the world one less."

THE following are the probable arrangements for the Friday evening meetings before Easter, 1880, at the Royal Institution:—January 16, Prof. Dewar, F.R.S.; January 23, Dr. W. B. Carpenter, C.B., F.R.S., "Sea and Land in Relation to Geological Time;" January 30, John Marshall, F.R.S., "Proportions of the Human Figure;" February 6, William Huggins, D.C.L., F.R.S.; February 13, W. H. Preece, C.E., "Wheatstone's Telegraphic Achievements;" February 20, Rev. H. R. Haws, "Old Violins;" February 27, Frederick J. Bramwell, F.R.S.; March 5, H. N. Moseley, F.R.S., "Deep-Sea Dredging and Life in the Deep Sea;" March 12, C. William Siemens, D.C.L., F.R.S.; March 19, Prof. Tyndall, D.C.L., F.R.S. The following are the lecture arrangements before Easter:—Christmas Lectures (adapted to a juvenile auditory): Prof. Tyndall, D.C.L., F.R.S., six lectures on "Water and Air," on December 27 (Saturday), 30, 1879, January 1, 3, 6, 8, 1880; Prof. Edward A. Schäfer, F.R.S., ten lectures on "The Physiology of Muscle," on Tuesdays, January 13 to March 16; H. Heathcote Statham, two lectures on "Modern Architecture since the Renaissance," on Thursdays, January 15 and 22; Prof. Dewar, F.R.S., eight lectures on "Recent Chemical Progress," on Thursdays, January 29 to March 18; Prof. T. Rupert Jones,

F.R.S., three lectures on "Coal," on Saturdays, January 17, 24, 31; Ernst Paner, three lectures on "Handel, Sebastian Bach, and Joseph Haydn" (with musical illustrations), on Saturdays, February 7, 14, 21; four lectures on "History of Literature," on Saturdays, February 28, March 6, 13, 20.

At the request of the Government of the Cape Colony and the trustees of the South African Library at Cape Town, Sir Bartle Frere has desired Prof. Max Müller and Prof. Sayce to select a qualified successor to the late Dr. Bleek, to continue his labours as colonial philologist and as custodian of the valuable library presented to the colony by Sir George Grey. The salary will be 500*l.* a year, of which 300*l.* will be contributed by the Government, and 200*l.* by the committee of the South African Public Library. Applications and testimonials only may be sent to Prof. Max Müller, Oxford.

THE lectures in connection with the Brown Institution will be delivered by Mr. W. S. Greenfield at the University of London on December 17, 18, 19, 22, and 23 at 5.30 P.M. The subject will be "Recent Investigations on the Pathology of Infective and Contagious Diseases."

THE French Minister of Public Instruction has appointed a section of the Commission of Historical Monuments for the purpose of establishing an official record of all megalithic constructions and erratic blocks discovered in France and Algiers.

THE grants voted by the Legislative Assembly of France for 1880 have been sent to the Senate, and according to every probability will be voted without any material alteration. The sum of 59 millions of francs was voted for public instruction, 2½ millions more than were asked for by the Government. In 1870 the grants for educational purposes were 26 millions and in 1851 only 16 millions. Among the items in the grants are the following:—The grant for the National Institute is 707,762 fr., for the Academy of Medicine 75,000 fr., the College of France 466,000 fr., the Museum of Natural History 835,000 fr., for astronomical and meteorological observatories 835,000 fr., for the National Library 674,000 fr., for the National Library and Museum of Algiers 296,000 fr., travelling expenses for explorers 200,000 fr., Ecole des Hautes Études (conducting experiments, &c., &c.) 300,000 fr.

THE Edinburgh Liberals, who have had a week of almost uninterrupted oratory from their idol, Mr. Gladstone, have been impressing science into their service, in order that Mr. Gladstone's voice might reach a much larger audience than any single hall in Edinburgh could hold. On Saturday he addressed an audience in the largest hall in Edinburgh, the Corn Exchange; but as this could not anything like hold the multitude that wanted to hear him, it was connected by telephone with another hall at some distance. We shall let the *Daily News* correspondent describe the result of the arrangement:—"The audience distinctly heard the cheering and singing of the meeting in the Corn Exchange, and also the strains of the band. Lord Roseberry's voice was also recognised, and it was gathered that he was saying pleasant things about Mr. Gladstone. Next came a burst of cheering, the sound of which was suddenly stopped, and a long interval of silence followed, varied from time to time by the murmur of distant cheers. Then as suddenly as silence had fallen, there came the sound of Mr. Gladstone's voice, and he was followed pretty well through 'some remarks on corn averages and the condition of India.' All this, which greatly mystified the telephonic audience, is capable of easy explanation. Observers of Mr. Gladstone's manner in the House of Commons will remember what an important part the right hon. gentleman's hat plays in his great speeches. He invariably places it on the table, a little to one side of him, and on the top of it he places his notes, which he rapidly shuffles and re-arranges as the oration

progresses. This afternoon, bringing his hat to the table in his accustomed manner, he unconsciously planted it right in front of the cylinder of the telephone which had been fixed on the table, thus, of course, cutting off the means of communication. As the speech proceeded, he began the re-arrangement of the papers and the movement of the hat, which latter he finally drew away from the telephone, and then became audible in another building a quarter of a mile off, 'some remarks on corn averages, and the condition of India.' It is a pity Mr. Gladstone had not been put up to the arrangement; we are quite sure, had he known, he would not have adopted so "obstructive" a line of action with his hateful of papers.

A NEW light company has started a public subscription in Paris for 80,000*l.* The inventor proposes to dispense with magneto-electric machines, by resorting to Bunson elements of special construction, and to dispense with regulators by incandescent light. An immense number of prospectuses have been circulated amongst the peasantry, and the funds are collecting with an amazing rapidity.

Scribner's Monthly, one of the best monthlies anywhere, has an interesting illustrated article in the December number on the Johns Hopkins University.

A COMPETITION having been opened for erecting a memorial of the siege of Paris on the Rond Pont of Courbevoie, M. Bartholdi, the author of the gigantic statue representing the French-America alliance, has executed a model representing a balloon with a sailor aeronaut and the besieged city receiving messages from a carrier-pigeon. The *ensemble* is grand and picturesque. It has raised the enthusiasm of Paris aeronauts, who are to make a public demonstration in support of M. Bartholdi's schemes.

THE *Colonies* of November 22 contains a long and valuable list of works on Commercial Botany, drawn up by Messrs. G. J. Symons and P. L. Simmonds.

THE new part of Mr. Bentham and Sir Jos. Hooker's "Genera Plantarum" will be published in January, and will complete the Dicotyledonæ. Only one other part, the Monocotyledonæ, will remain to be published.

ON November 21 M. Mariette-Bey read, before the Academy of Inscriptions of Paris, a long report on the new excavations which are to be executed in Egypt. This address having been delivered in a solemn meeting of the Academy, it is certain that the illustrious Egyptologist will obtain a grant from the French Government.

THE *Kölnische Zeitung* says that a rack railway, of the Righi type, will be erected on the Drachenfels, one of the seven hills situated on the left bank of the Rhine. The survey of the intended line is proceeding with activity.

THE Kane Geyser, or spouting water-well, has lately attracted much attention from the sight-seeing public. Some exact data regarding it are furnished in a recent notice by Mr. Ashburner (*Amer. Jo. of Sci. and Arts*, November). The well is situated in the valley of Wilson's Run, near the Philadelphia and Erie railway line, and four miles south-east from Kane. It was drilled in the spring of 1878 to a depth of 2,000 feet, but, as no petroleum was found in paying quantities, the casing was drawn and the hole abandoned. In drilling, fresh-water veins were met with down to 364 feet, which was the limit of the casing. At 1,415 feet a very heavy "gas-vein" was struck, and this gas was allowed free escape while the drilling was continued to 2,000 feet. When the well was abandoned, the fresh water flowed in, and the conflict between the water and gas commenced. The water flows into the well on top of the gas till the pressure of the confined gas becomes greater than the weight of the superincumbent water, when an expulsion takes place,

and a column of water and gas is thrown up to a great height. This occurs at present at regular intervals of thirteen minutes, and the spouting continues for one and a half minutes. The column, according to measurement, varied in height from 108 to 138 feet. The gas of the mixture can be readily ignited. After nightfall the spectacle is grand. The antagonistic elements of fire and water are so promiscuously blended that each seems to be fighting for the mastery. At one moment the flame is almost entirely extinguished, only to burst forth at the next instant with increased energy and greater brilliancy. During sunshine the spray forms an artificial rainbow, and in winter the columns become incased in huge transparent ice-chimneys.

WE have received the numbers for October and November of the *Natural History Journal* "conducted by the Societies in Friends' Schools." This journal continues to sustain its reputation, and several papers in these numbers are highly creditable.

THE *Colonies and India* states that a new store of guano has lately been discovered in a series of caves about 100 miles east of Cape Town. It is described as being a light-brown powdery mass, in which a number of solid nodules occur. An analysis shows that it contains 68 per cent. of ammonia compounds, 16 per cent. of phosphates, and 2 per cent. of nitrogen. In the same caves are considerable quantities of salts, forming a crystalline mass, and containing 33 per cent. of phosphoric acid, 11 per cent. of sulphuric acid, 15 per cent. of nitric acid, 19 per cent. of potash, and 7 per cent. of ammonia.

CONSUL CALVERT, reporting on the trade and commerce of Alexandria for 1878, thus refers to the new fodder plant, the *Téosinté* (*Euchlœna luxurians*), which has attracted so much attention lately in tropical countries. During the last three or four years experiments have been made at Cairo and attended with complete success, and it is expected that it will eventually prove to be a great acquisition to Egyptian agriculture. The plant attains the height of from thirteen to sixteen feet, and so rapid is its growth that in an experiment made in July at Cairo the plant after having been mown down grew one foot in four days. On analysis the plant is found to contain much saccharine matter, and to be much more nourishing for animals than the native clover or *verseem* (*Trifolium alexandrinum*).

UNDER the title of "Notes on the Flora of Surrey," a list of plants known to occur in the five adjoining counties, but not really known in Surrey, has been published by Mr. A. Bennett, of 107, High Street, Croydon, who has issued the list "as a first step towards a proposed supplement to the flora of the county, and with the wish that those botanists who may be able to help will kindly do so, either in confirming by specimens any doubtful plants reported for the county, or by giving the localities where they may be gathered, so that search may be made next season." Mr. Bennett's list is a useful one, though the botanical nomenclature has been very carelessly corrected, if indeed corrected at all.

MR. CHARLES GILBERT, of Bedford Street, has published "Tables of Metric Measures and their English Equivalents," by G. M. Barns, for use by engineers, architects, contractors, and others.

WE some time ago announced the death of the librarian of the "Leopoldino-Karolinische" Academy for Natural Sciences, Dr. Behn, of Dresden. The statutes of the Academy prescribe that the library must be at the librarian's place of residence. Consequently the whole library, consisting of some 40,000 volumes, has been transferred to Halle, where Dr. H. Knoblauch is the new librarian.

In a lecture delivered at Bristol by Mr. Lant Carpenter, he spoke of his recent visit to the United States, and remarked that amongst the various improvements and things which were being

tried there, one that struck him as much as anything was the extraordinary development within the last two or three years of the application of electricity to the purposes of practical life. He gave several remarkable examples of the way in which the system is applied in the United States for the protection of safes, vaults, and other valuable property, alarms being rung in a central office whenever a forcible entrance was attempted in any one of, say, 500 vaults, the alarm indicating which one. In many cities and towns in the States, he said, there were district telegraphs established. From a central office wires ran to every private house in the district which wished to be connected, and by this means you could communicate with the central office, and by a prearranged set of signals on a bell, the inmates of the house could call a cab, a policeman, a messenger, or a doctor, by simply pulling a handle. The lecturer, in speaking of the practical application of electricity to a system of fire alarms, explained the general system pursued in all large towns in the United States, and spoke of the extraordinary rapidity with which fire-engines are turned out ready for use on receipt of the electric signal. Six or eight seconds was the usual time. Electric signal boxes were fixed in the streets, and any person, on becoming aware of a fire, could turn a handle and communicate at once with the central stations, where the officials would know from which box the signal came. An automatic system was at work in New York, where 500 shops, stores, and warehouses were protected by an apparatus which sounded an alarm in a central office whenever the temperature of any place rose above a given point. Mr. Carpenter stated that in all large towns in the United States of America there was a system of telephone exchanges established. It was a system by which a large number of persons had these telephones in their houses, the wires of which all converged in a central office, and by such an arrangement any one of the subscribers to the exchange could talk to any other person who was also a subscriber through the central office. The wire from each house ended in the central offices, and by simple arrangements any one wire could be readily joined to any other, thus putting two people into communication. The lecturer gave instances of this arrangement, explaining that so perfectly were these telephones constructed that a person's voice could be readily and easily recognised. The lecturer proceeded to comment upon their recent extraordinary and rapid development in every large town in the United States. The subscribers to these exchanges were numbered by thousands, and their uses and advantages were many. Not only were they now connecting different parts of one town by means of these exchanges, but steps were being actively taken to connect towns together by similar means. In conclusion, the lecturer urged that if science, practically applied, was to form so large a portion of our daily life, was not that a very strong argument for so arranging our educational work that every child should be instructed in the rudiments of science? Dr. W. B. Carpenter, having been invited to address the meeting, said he felt convinced that in the next generation the telephone would become almost as generally used as the telegraph was now, though he did not mean to say the latter would be superseded.

AN interesting Roman structure has recently been discovered at Regensburg (Ratisbon). It consists of a subterranean aqueduct of some 10 metres in length, 1½ metres in height, and 60 centimetres in breadth, built of colossal blocks of stone.

THE additions to the Zoological Society's Gardens during the past week include a Common Wood Owl (*Syrnium aluco*), European, presented by Mr. W. J. Smith; a Turquoise Parakeet (*Euphema pulchella*) from New South Wales, presented by Mr. A. Batterscombe; a Macaque Monkey (*Macacus cynomolgus*) from India, a Barbary Falcon (*Falco barbarus*) from North Africa, deposited; a Reeves's Muntjac (*Cervulus reevesi*), born in the Gardens.